

WHAT IS CLAIMED IS:

1. An apparatus for cooling an article having opposite substantially planar outer surfaces in an evacuated environment, comprising:

a heat exchanging structure, said structure having a pair of stationary heat sinks having substantially planar parallel facing surfaces disposed within a vacuum chamber;

transfer means for moving the article into and out of a position with its respective outer surfaces adjacent to and substantially parallel with said facing surfaces of said heat sinks;

said heat sinks being spaced a predetermined distance apart sufficient to permit the insertion and removal of said article therebetween without contact with said heat sinks;

said predetermined distance being further selected to permit a substantial convective/conductive heat transfer from said article to said heat sinks; and

means for providing a high conductivity gas flow between said heat sinks and said article at a pressure significantly above that of said vacuum chamber, yet substantially below that of the atmosphere.

2. The apparatus of Claim 1 wherein said predetermined distance from said facing surfaces of said heat sinks to said facing surfaces of said article is generally between 0.05 to 0.25 in.

3. The apparatus of Claim 1 wherein said heat sinks include means for cooling said heat sinks.

4. A method for cooling an article having opposite substantially planar outer surfaces in an evacuated environment, comprising:

spacing a pair of heat sinks having substantially planar parallel facing surfaces a predetermined distance apart, said heat sinks being operatively mounted within a processing chamber adapted to operate at a pressure substantially less than atmospheric pressure;

said predetermined distance being selected to permit the insertion and removal of the article therebetween without contact with said heat sinks, yet close

enough to permit a substantial convective/conductive heat transfer from said article to said heat sinks;

pre-cooling said heat sinks to a predetermined temperature;

positioning said article between said spaced heat sinks such that said
5 respective outer surfaces of said article are adjacent to and substantially parallel with the facing surfaces of said heat sinks;

introducing a high thermal conductivity gas flow between said heat
sinks and said article at a pressure significantly above that of said processing
chamber, yet substantially below that of the atmosphere to facilitate the heat transfer
10 from said substrate to said heat sinks; and

removing said article from said processing chamber after said article is
cooled to a predetermined temperature.

5. The method of Claim 4 wherein said predetermined distance
from said facing surfaces of said heat sinks to said facing surfaces of said article is
15 generally between 0.05 to 0.25 in.

6. The method of Claim 4 wherein said heat sinks are pre-cooled
to a temperature in the range of approximately -50°C. to -200°C.

7. The method of Claim 4 wherein said high thermal conductivity
gas is selected from the group consisting of helium and hydrogen.

20 8. The method of Claim 4 wherein said high thermal conductivity
gas pressure is maintained in the range of approximately 1 to 10 Torr.

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